

## CASE STUDY

## Innovation in the milling industry at Walk Mill

Modern screener in old water mill produces high quality flour

by Henry Alamzad, President, Kason Corporation

If visitors from centuries past returned to a familiar footpath by the River Gowry in northern England, they might be shocked by changes that have taken place, but there would be one comforting sight, the old mill with its large water wheel. Powered by a stream diverted from the river, the wheel works through gears to grind wheat into flour for making bread.

Inside the mill the wheat is ground between two flat, 135 cm diameter millstones, a method employed for hundreds of years. However, our time traveller would likely be puzzled by some of the equipment, in particular an electrically driven centrifugal screener. The Centri-Sifter™ centrifugal sifter, as it is called, was supplied by Kason Corporation (Millburn, New Jersey, USA) and recovers the mill's two basic products: white and whole meal flours.

There has been a water mill at the site since the 13th century, but the present building, Walk Mill, is no older than the screener, despite its aged appearance. Rebuilt as a replica of an earlier mill, the new facility started up in 2008.

The last mill on the site ceased production in 1915 and only the footprint of the building

was left, says Ben Jones, a partner in the family-owned business, who is in charge of mill operations. "We dug the foundations to find the footprint of the building and we also had a lot of photographs of the old mill. From the footprint and the pictures we were able to construct a building that is exactly like the old mill on the outside."

### Wheat is at hand

Located on the fertile Cheshire plain, close to the historic city of Chester, Walk Mill is surrounded by roughly 405 hectares of wheat fields that were acquired by the Jones family some years ago. "We have always been farmers, says Ben Jones, "and after we bought this land we decided to rebuild the mill."

Wheat is harvested from the fields, dried to reduce the moisture content and cleaned to remove chaff. It is then taken to the mill in a sealed trailer and loaded into a hopper on the first floor. The hopper





has a capacity of 2000 kg, which is enough to meet the mill's needs for four to six days, depending on the rotation speed of the water wheel.

From the floor hopper, the wheat is moved by an auger conveyor to a smaller feed or transit hopper of 50 kg capacity, located above the millstones. The grains fall from the bottom of the feed hopper to the millstones, where they are ground into flour.

Walk Mill uses two burr stones, made of hard, dense French granite. The stones are positioned horizontally, one above the other. The lower stone, called a bedder, is fixed, while the upper one (the runner stone) rotates. Wheat from the hopper falls into a hole in the centre of the upper stone and gradually moves to the periphery of the stones via shallow grooves in the stones. The tiny gap between

the stones is adjusted to produce white or whole meal flour, the latter being coarser because it contains bran.

Both the stone rotation and the feed rate from the hopper are governed and synchronised by a shaft that is geared to the water wheel. The bottom end of the shaft is attached to the runner stone and carries the weight of the stone as well as rotates it.

### **An old damsel controls the flow**

Grain trickles from the hopper along a vibrating wooden trough, called a shoe. A forged metal device, called a damsel that is attached to the upper end of the shaft, imparts the vibration. The damsel, incidentally, was retrieved from the earlier mill.

"It's self regulating," says Jones.



“If the water flow increases, the feeding and milling operations increase at the same rate.” Jones adds that a shaft rotation rate of about 40 rpm yields the best quality of flour. The relatively slow, gentle and cool process avoids overheating of the flour, he says, and preserves all the good parts of the grain: protein, oils, vitamins, sugars, starches and bran.

As the flour leaves the periphery of the millstones, it is swept by a blade attached to the upper stone and falls into a 12.5 kg transit hopper. An auger transfers the product to a spout that feeds the Centri-Sifter screener, which separates the desired flour from the rest of the material. The model GOB-SS machine has a sifting area of 1103 square centimetres. It is driven by a 1.5 kW motor and can process up to 700 kg per hour, well

beyond the mill’s capacity of 80 kg per hour.

The screener is a compact centrifugal machine, with a cylindrical sifting chamber that contains a cylindrical screen of nylon mesh. Flour is fed pneumatically into a vertical feed inlet at one end of the unit, and then redirected by a feed screw into the chamber, which is oriented horizontally.

**Centrifugal force makes for efficient separation**

Rotating helical paddles within the chamber continuously propel the flour against the screen and the centrifugal force accelerates the particles through the screen openings. The rotating paddles, which make no contact with the screen, also break up soft, agglomerated material. The separated flour is directed to a chute, from which it drops directly into a 25 kg sack for shipping. When the sack is full the auger is stopped until a new sack is in place.

Walk Mill uses two screen sizes: 38 mesh (500 μm) for white flour and 12 mesh (1500 μm) for the coarser whole meal flour.

“Typically we produce white flour for four days, because we sell more of it, and wheat flour for one day,” says Jones.

In the case of the finer, white flour the product passes through the screen for bagging, as explained above. Coarser, waste material is retained by the screen and moves along the chamber to the far end, where it is recovered through a second discharge spout. In the case of bran, fine waste material is ejected through the screen, while the bran is retained and collected from the second outlet. All the waste is bagged and used for feeding pigs.

The company found the centrifugal sifter through an Internet search and bought it after seeing a demonstration at Kason’s facility in Stoke-on-Trent. The screener achieves a very good separation, with no wasted product, and the quality of the flour is excellent, says Caroline Jones, Ben’s daughter, whose principal responsibilities are baking and running the company tearoom for visitors (her mother handles the accounts and her brother farms the land).

“The machine is very easy to operate and there is no problem with screen clogging,” she says. “We occasionally dust it down, but basically it cleans itself

Walk Mill serves two markets. The 25 kg sacks are shipped to upscale restaurants and hotels that make their own bread. For the retail market, flour is delivered in 1.5 kg bags that are filled by hand from the larger sacks.

In addition to white and wholemeal flour, Walk Mill sells two other types of flour: malted flour, which is white flour plus malt flakes and malt extract, and self-raising flour (white flour plus baking powder) for making cakes. Malted flour is packaged for both wholesale and retail sale and self-raising flour is sold only retail. ☺



Editorial has been extracted from the publication